DOCUMENT RESUME

ED 110 072 IR 002 373

AUTHOR Williams, Mary Carter; Milner, Stuart D.
TITLE The Attitudes of Medical School Administrators Toward Cost Factors Relating to Computer-Assisted Instruction.
PUB DATE Jan 75
NOTE 23p.; Paper presented at the Association for the Development of Computer-Based Instructional Systems Winter Meeting (Charleston, South Carolina, January 28 -30, 1975)

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS *Administrator Attitudes; College Deans; *Computer Assisted Instruction; *Cost Effectiveness; Costs; *Medical Schools; *National Surveys

ABSTRACT

The attitudes of medical school administrators toward six cost factors relevant to the production of sophisticated clinical programs in schools which offer, expect to offer, or do not expect to offer CAI (Computer Assisted Instruction) were identified and compared. The six cost factors were: (1) authorship, (2) incentives, (3) distribution, (4) replacement, (5) evaluation, and (6) training. The major hypothesis was that the attitudes of administrators in medical schools which offered, expected to offer, or did not expect to offer CAI toward the six cost factors would not differ significantly. The population of the study was composed of deans and dean appointees of 115 colleges of medicine in the United States. Survey research techniques were used to determine the attitudes of administrators towards the six cost factors. It was found that all of the groups of administrators had similar attitudes towards and were generally receptive to the relevance of the six factors. Additionally, they expressed uncertainty about the role of cost-effectiveness in the production of clinical programs. (SBM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED110072

THE ATTITUDES OF MEDICAL SCHOOL ADMINISTRATORS TOWARD COST FACTORS RELATING TO COMPUTER-ASSISTED INSTRUCTION

Mary Carter Williams[1]
Dudley W. Gill & Associates
Washington, D. C. 20036

and

Stuart D. Milner[2]
School of Education
Catholic University of America
Washington, D. C. 20064

ABSTRACT

This study identified and compared the attitudes of medical school administrators toward six cost factors relevant to the production of sophisticated clinical programs in schools which offer, expect to offer, or do not expect to offer CAI. The six factors were: authorship, incentives, distribution, replacement, evaluation and training.

It was found that all three groups of administrators had similar attitudes toward and were generally receptive to the relevance of the six factors. Additionally, they expressed uncertainty about the role of cost-effectiveness in the production of clinical programs.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

---

[1]Dr. Mary Carter Williams is a management consultant with Dudley W. Gill & Associates, Washington, D. C. 20036.

[2]Dr. Stuart D. Milner is assistant professor of education in the Center for Educational Technology, School of Education, Catholic University of America, Washington, D. C. 20064.

IR 002 373

THE ATTITUDES OF MEDICAL SCHOOL ADMINISTRATORS TOWARD COST FACTORS RELATING TO COMPUTER-ASSISTED INSTRUCTION

Mary Carter Williams
Dudley W. Gill & Associates
Washington, D. C. 20036

and

Stuart D. Milner
School of Education
Catholic University of America
Washington, D. C. 20064

INTRODUCTION

During the past decade, pioneer efforts in instructional computing in colleges of medicine have been catalyzed by administrators who were responsive to computer-assisted instruction (CAI) development. Initially, the thrust of the development function was construction of interactive computing systems: the major cost center was hardware. Today, the thrust of the development effort is provision of a repertoire of quality programs, particularly for clinical education: the major cost center is program production.

As with the development of early prototypic interactive systems, the success of current and future program production efforts is contingent upon substantial administrative support. Moreover, the economic dilemmas and accountability pressures facing medical education suggest that such commitment will not be forthcoming unless the medical school administrator perceives CAI as educationally effective, cost saving technology.

While some authorities predict that CAI will play a significant role in the future of medical education, others assert that widespread use of CAI in health science education, and higher education in general, will be contingent upon resolution of several human/technical problems. Studies by Levien, et. al. [1], Luskin [2], and Anastasio and Morgan [3], as well as commentaries by Stolurow [4], suggest that one of the greatest impediments to widespread use of CAI in education is the lack of high quality curriculum materials which exploit the unique capabilities of the computer--for example, CAI programs that utilize simulation, dialogue or inquiry mode to teach complex intellectual skills.

Other issues integrally related to course development include questions about who will author programs, incentives for faculty participation in program production, models for distribution, use of CAI in place of conventional modes of instruction, evaluation of the educational effectiveness of programs and training programs.

A major obstacle to accelerated use of CAI in medical education, particularly in clinical instruction, is the lack of explicit data on (1) cost factors which influence production of programs and (2) the attitudes of administrators toward pertinent cost considerations. The paucity of data in these areas hampers both instructional decision-making and the acquisition of administrative support for CAI development.

The major purpose of this study was to identify and compare the attitudes of medical school administrators toward six cost factors relevant to the production of sophisticated clinical programs in schools which offer, expect to offer, or do not expect to offer CAI. The six factors were: authorship, incentives, distribution, replacement, evaluation and training. CAI was defined as instructional programs utilizing dialogue, inquiry, or simulation models to teach complex intellectual skills pertinent to the mastery of the clinical encounter. In addition, the study was designed (1) to orient medical school administrators to cost considerations pertinent to the development of sophisticated clinical programs; (2) to provide a data base for obtaining administrative commitment to production of sophisticated clinical programs; and (3) to facilitate the planning of change in the field of CAI.

METHODOLOGY

The population of the study was composed of the deans and dean appointees of the 115 colleges of medicine located in the United States. Seventy-three per cent responded to the mailing; however, only 68 per cent of the respondents (79 total) actually completed the instrument. Of these 79, there were 48 in

the group presently offering CAI, 23 who intended to offer CAI, and 8 who did not anticipate offering CAI.

The characteristics of each group of administrators varied with group membership. For instance, two-thirds of the administrators in medical schools which already offered CAI had broad computer-related experience. They had authored programs, designed CAI software or hardware, directed CAI systems or data processing units, trained users, used the computer for administrative support and participated in curriculum design. Conversely, the administrators in medical schools expecting to offer CAI had limited computer-related experience. Administrators in medical schools which did not expect to offer CAI were least familiar with instructional computing.

Survey research techniques were used to determine the attitudes of administrators toward the six cost factors. Since no appropriate instrument existed, an attitude scale was constructed using the Likert Method of Summated Ratings. Implementation of this method included the following steps:

- collection of a preliminary pool of items related to the cost factors under investigation;
- content validation of the opinion pool by a jury of experts;
- construction and pilot administration of the preliminary scale; and
- performance of several item analyses to provide data for construction of an improved instrument and the final scale.

The final instrument was composed of 28 attitude statements or six subscales which corresponded to the aforementioned cost issues, four additional items and an identification field of three items. The reliability of each of the subscales, when stepped up to 40 items by the Spearman-Brown formula, ranged from .60 to .93. Table 1 summarizes the reliability indices.

insert Table 1 here

The objective of each of the six subscales is discussed below.

Authorship Subscale - Essentially, the authorship subscale was designed to identify what medical school administrators perceived as the most effective means of authoring programs. The subscale also addressed updating programs and prerequisites for faculty involvement in authorship of programs.

Incentives Subscale - The incentives subscale was designed to identify the attitudes of medical school administrators toward two kinds of incentives: professional recognition and released time.

Distribution Subscale - The purpose of the subscale was to determine the opinions of administrators of medical schools regarding (1) available information on CAI programs, (2) cost-effectiveness as a requirement for distribution of programs, (3) what organizational arrangement should be responsible for the distribution process, (4) what body should be responsible for the identification of programs which qualify for distribution, and (5) what standardization efforts would facilitate widespread distribution of programs.

Replacement Subscale - Replacement referred to the use of clinical programs in place of conventional approaches to instruction. The primary purpose of the subscale was to determine if administrators felt that cost-effectiveness, faculty acceptance, and a long lead time should be requirements for replacement. In addition, the subscale was designed to question the impact of CAI cost savings on the hiring of faculty.

Evaluation Subscale - The evaluation subscale contained four items related to the role of education in the total CAI effort and to which subsystems of the

university should participate in the evaluation process. Specifically, the subscale was designed to determine whether administrators felt that evaluation should be an integral part of the total production process (including initial planning activities and procedures related to design, development, implementation and maintenance) and whether students should participate in program assessment.

Training Subscale - The training subscale dealt with planned and systematic activities for orienting faculty members, administrators and other users to the information required for effective use of CAI or participation in various phases of the production process. It was designed to determine whether administrators of medical schools felt that development and diffusion of CAI would require special training programs. In addition, the subscale posed questions regarding what the content of such programs should include, what the major objective of the programs would be, and the role of computer scientists in training medical faculty to write programs.

RESULTS

The major hypothesis of the study was that the attitudes of administrators in medical schools which offered (Group 1), expected to offer (Group 2), or did not expect to offer (Group 3) CAI toward the six cost factors would not differ significantly.

Since the three groups were being compared on six dependent measures, multivariate analysis of variance (MANOVA) was used to test for equality of dispersion and centroids [5]. Because of the sizeable discrepancy between the N of Group 3 (8) and that of Groups 1 and 2 (48 and 23, respectively), the equality of dispersion among the three groups of administrators was computed to determine whether the variance-covariance matrix of Group 3 was significantly

different from that of the other two groups. The test for the equality of dispersion among the groups indicated that the populations of all three groups had similar variance-covariance matrices ($F=0.91$, $df=42/1352$, $p>.05$). The observed differences among centroids were not statistically significant ($F=0.75$, $df=12/142$, $p>.05$).

Generally, all three groups of administrators tended to agree that:

- faculty members should have primary responsibility for writing programs as part of a production team structure;
- new incentives such as professional recognition and released time would be required to encourage faculty participation in program production;
- distribution and replacement are cost issues which might or might not be relevant to production of programs;
- evaluation should be an essential element in the total production process; and
- training for faculty authors would be required if quality programs are to be developed.

Subscales

In this section, an abbreviated description of items is presented along with the associated data by group. Since the response continuum for the instrument contained five alternative positions--strongly agree, agree, uncertain, disagree, and strongly disagree--numerical values were assigned as 5, 4, 3, 2, and 1 respectively. Consequently, a favorable attitude was reflected in a value close to 5 and an unfavorable attitude in a value close to 1. A score of 3.0 reflected uncertainty.

The assumed midpoint of each interval (4.5, 3.5, 2.5, and 1.5) was used to determine the intensity of an attitude which fell between intervals. If an attitude fell beyond a midpoint, the next alternative response was used to

interpret the score. On the contrary, if an attitude fell below a midpoint, the preceding alternative response was used to interpret the score.

Table 2 summarizes the total means, standard deviations, and Likert-scale equivalent means for the three groups. In reporting the scores, the order of listing was consistently Group 1, Group 2, and Group 3 respectively.

---

insert Table 2 here

Authorship Subscale - The Likert-scale equivalent means for the total subscale were 3.68, 3.63, and 3.56. These scores suggested that administrators in all three types of institutions tended to believe that faculty members should have major responsibility for writing and updating the content of programs, and further, that faculty authors can best perform as part of a team of production specialists.

One item dealt with faculty orientation as a requirement for authorship. Groups 1 and 2 questioned broad faculty orientation to CAI as a requirement for faculty participation in the authorship process, whereas Group 3 tended to disagree. Perhaps the uncertainty suggested by these scores reflected the difficulties involved in finding persons with the appropriate authorship skills.

Incentives Subscale - In this instance the data suggested that administrators in all three groups recognized the inadequacy of existing reward systems and the need for new incentive systems if faculty members were to play an active role in program production. The Likert-scale equivalent means were 4.21, 3.97, and 4.12.

Two-thirds of the administrators in Group 1 had authored programs as well as participated in other aspects of CAI development. Since these administrators

were more aware of the time requirement for authoring programs--an estimated 50 to 200 development hours for one CAI hour--it was predicted that the administrators in Group 1 would have a higher regard for released time than administrators in Groups 2 and 3. Similarly, one might have guessed that administrators in schools which were planning to offer CAI (Group 2) would have had a more favorable attitude toward released time than administrators in Group 3. The descriptive statistics for the associated item suggested that administrators in Groups 1 and 3 tended to agree that released time would be a useful incentive for faculty participation in program production, while those in Group 2 tended to be uncertain. Consequently, contrary to prediction, the administrators in Group 3 had a more favorable attitude toward released time than either Group 1 or 2.

That this prediction appeared not to have been sustained may suggest that the heavy patient care and research responsibilities of clinical faculty militate against the use of released time as an incentive for faculty involvement in writing programs. In addition, the uncertainty evident in the scores of all three groups of administrators suggests that the administrators question the economic feasibility of obtaining released time during a period of general "belt-tightening."

Distribution Subscale - The Likert-scale equivalent means for the three groups of administrators were 3.47, 3.52, and 3.49. This suggests that all three groups of administrators questioned the relevance of distribution to production of sophisticated clinical programs. Here again, the uncertainty expressed by the participants may reflect the uncertainty in the field of CAI in the health professions generally about what cost specifications would promise effective diffusion of programs. One could use rational argument to predict that the current plight of medical education would force medical school

administrators to perceive cost-effectiveness as a major criterion for distribution. However, the results do not substantiate this: all three groups appeared uncertain about the matter.

A major hindrance to widespread distribution of programs is the lack of transportability of programs. CAI delivery systems and languages vary from institution to institution. Items dealing with transportability and standardization of languages addressed to this issue suggested that programs should be transferrable from hardware system to hardware system and that standardization of languages would enhance transferability of courseware.

The results indicated that the three groups of administrators favored the production of programs which could be used on various hardware systems to facilitate widespread distribution of programs. All three groups also appeared to agree that some standardization of languages would be a reasonable requirement for diffusion efforts.

Three items dealt with information dissemination, use of professional review boards for identifying programs which qualify for production, and rigorous testing of programs as a requirement for distribution. According to the results, Groups 1 and 3 appeared to question whether information dissemination had been a major obstacle to widespread distribution of programs while Group 2 tended to agree with the item. All three groups of administrators questioned whether professional review boards should play an evaluative role with respect to selection of programs which qualify for marketing; however, they appeared to agree that rigorous testing should precede distribution of programs.

In light of the financial state of most medical schools and the heavy time commitments of clinical faculty, it seemed reasonable to predict that administrators in the three sample groups would not have opposed private control of the dissemination function. However, the results of the item dealing with commercial

versus discipline-based control revealed that administrators in all three groups tended to be uncertain about the matter. The indecision of the groups may be related to the public versus private issue or, perhaps, to general uncertainty about the requirements for effective dissemination of a new technology.

Replacement Subscale - The Likert-scale equivalent means for the total scores obtained were 3.21, 3.32, and 3.27. In this instance, the mean scores for each sample group were closer to 3.0, the numerical value assigned for uncertainty, than 3.5, the numerical value assumed for the midpoint between the agreement-uncertainty interval. The scores demonstrate, then, that administrators in all three groups were uncertain about the role of replacement in the diffusion process.

Since replacement is predicated upon the acceptance of change, this was not a surprising finding. In addition, in light of the dichotomous nature of control in universities, the question becomes this: what kinds of changes in the decision-making apparatus of the medical school will be required to insure that the cost savings possible through use of sophisticated programs can be realized?

Two items addressed cost-effectiveness as a requirement for replacing traditional instruction and decelerating the rate of acquisition of new faculty as CAI cost savings resulted. There appeared to be conflicting viewpoints regarding both of these issues. That is, Groups 2 and 3 tended to support use of cost-effectiveness as a requirement for replacement, while Group 1 tended to be uncertain. In respect to faculty hiring policy, Groups 1 and 2 appeared to oppose deceleration of the rate of acquisition of new faculty, while Group 3 tended to be uncertain. Of course, the small size of N for Group 3 may have distorted the results for individual items.

Results of an item dealing with replacement versus the use of alternative resources suggested that clinical programs be substituted for conventional modes

of instruction such as books, lectures, and demonstrations. Administrators in all three groups tended to be uncertain about this. However, the scores for Groups 1 and 3 were very close to 2.5, the midpoint for the disagree-uncertainty interval; whereas, for the total subscale, the scores for all three groups fell within the uncertainty-agree interval.

Evaluation Subscale - The Likert-scale equivalent means for the total scores obtained for the groups on the evaluation subscale were 4.24, 4.27, and 4.25. These results suggested that administrators in all three groups affirmed that evaluation was a critical issue. Specifically, the administrators tended to concur that evaluation should be a key concern for initial planning to implementation; that demonstration of the educational effectiveness of programs would accelerate administrative and faculty acceptance of programs; and that students should participate in the assessment of programs.

The level of agreement for evaluation probably reflected (1) the desire of medical administrators to prevent recurrence of the uncontrolled growth and development which precipitated the current fiscal dilemma in medical education and (2) their concern for the need to document the soundness of administrative/instructional decisions.

Training Subscale - All three groups of administrators felt that training programs were needed. The Likert-scale equivalent means were 3.82, 3.83, and 3.83.

Because CAI is a developing technology, modes and procedures for development and implementation are still unfolding. Since the authorship process for CAI is quite different from that for provision of traditional course materials, faculty members interested in participating in program production require orientation to the computer itself, as well as procedures for writing and formatting

content. The items dealing with training in programming languages, instructional theory, and the use of computer scientists with medical training as trainers of faculty raise questions about specific requirements for such training programs.

The results concerning programming languages and instructional theory suggest that the content of training programs should include them. It was also suggested that computer scientists with medical training can be effective trainers.

One item dealt with the fact that trivial uses of the computer exist because faculty are not sufficiently oriented to the capabilities of the computer as a teaching instrument. The mean scores for the groups suggested that all three groups of administrators tended to agree with this.

Additional items - Four items were excluded from the inferential analysis because they substantially weakened the reliabilities of the subscales. These items related to indefinite faculty control of programs, the role of students in the evaluation process, transferability as a criterion for professional recognition, and the role of medical faculty in planning training programs.

Administrators in Groups 1 and 3 opposed indefinite control of programs by faculty authors; however, Group 2 tended to be uncertain. All three groups of administrators seemed to feel that students should be encouraged to author programs. One item recommended that only programs which were compatible with the hardware systems of a number of institutions should qualify for professional recognition. The results suggested that the administrators in Groups 1 and 3 were opposed to transferability as a requisite factor for professional recognition; however, Group 3 tended to be uncertain.

Regarding the item that addressed the role of medical faculty in planning training programs for faculty, it was interesting to note that all three groups of administrators were uncertain about this.

DISCUSSION

Although the computer-related experience of the administrators varied with group membership, all three groups had similar attitudes toward the relevance of all six cost factors to production of sophisticated clinical programs. This similarity in viewpoints may be due to any one or a combination of three factors: the tempering effect of broad CAI experience in a university setting; the newness of CAI in medical education and higher education generally; and the universality of cost issues such as rewards for research on teaching, evaluation, accountability and the "new depression" in higher education.

Tempering Effect of Prior CAI Experience - In light of the CAI experience of two thirds of the administrators in Group 1 and the existence of CAI efforts in their home institutions, it seemed reasonable to predict that the administrators in this group would have had significantly more favorable attitudes toward the cost factors under investigation than administrators in Groups 2 and 3. This prediction was not sustained.

An explanation for the similarity between the opinions of Group 1 and those of the remaining two groups may be that the broad experience of the administrators in Group 1 served as a tempering force. That is, the issue of development and diffusion of sophisticated clinical programs is fundamentally dependent on changes in policies, ideas and instructional management patterns. The difficulty involved in initiating these changes contributes to the rejection of innovations that deviate radically from classical modes of teaching-learning. When confronted with powerful conflict points such as lack of funds, the autonomy and disinterest of faculty members, irresponsive reward systems, rigid time and space patterns, inadequate time for development and lack of an established set of guidelines and procedures for both the course development and costing functions,

Group 1 administrators may have been forced into a choice based on practicality rather than ideology. Their assessment of the items in each subscale may have been tempered by what they perceived as the present economic, technical or institutional feasibility of the recommendations made. Consequently, as a group, the administrators may have responded conservatively to the authorship, distribution, replacement, and training subscales, with their Likert-scale equivalent mean scores falling between 3.0 and 4.0.

The Newness of CAI and Cost Estimation - Computer-assisted instruction, as well as use of cost estimation techniques such as cost-effectiveness and cost-benefit analysis, is an emerging technology in medical education and higher education generally. Hence, the newness of the technologies and the questions that the administrators may have raised about them because of their newness may have transcended the experience differential which characterized each group of administrators.

Although medical education has assumed a leadership role in CAI development for more than a decade, development efforts have been primarily exploratory in nature and limited to a few schools. Furthermore, most of the advances in interactive systems and program production have been generated by three schools: Ohio State University, the University of Illinois, and Harvard Medical School (Massachusetts General Hospital).

In addition, as an emerging technology CAI has not matured into an organized body of knowledge with a carefully defined structure based on tested assumptions and theories. Basic research related to (1) the nature of CAI, (2) learning theories such as reinforcement and transfer in CAI environments, and (3) viable models for processes such as production, marketing and evaluation in a University setting is needed. In addition, the issues of demonstrated effectiveness, control of programs, rewards and training have yet to be resolved.

Consequently, it is possible that the instability of computer-assisted instruction, both as a developing discipline and applied science, may have confused administrators as well as splintered their efforts to define the role of the computer in medical education.

Universality of Cost Issues - CAI is emerging in an era of transition in higher education. Universities are being confronted with unprecedented fiscal and social pressures. For example, the cost of education is rising significantly faster than income flow. The public is demanding that universities demonstrate fiscal restraint and managerial/instructional accountability while calling for instructional reform, timely delivery of broader community services, open access and affirmative action.

In essence, the university is being asked to demonstrate unity of purpose, administrative direction and use of management technologies which promise fiscal control and timely decision making. The nature of these pressures speaks to the inadequacy of the basic structure of the higher education establishment and probably dominates the thinking of most university administrators.

Since some of the cost issues in this study touched on some universal problems in higher education (e.g., regards for teacher effectiveness and basic research on teaching, managerial and instructional accountability), it is possible that the administrators were responding to these considerations rather than to cost as it relates to production of sophisticated programs.

IMPLICATIONS FOR CAI DEVELOPMENT AND PLANNING

The challenge of the medical school administrator is not only to maintain the organization but to generate fiscal and instructional renewal based on documentation of need and validation of the legitimacy of decisions. The ultimate challenge to the medical school administrator is to create an organizational

spirit responsive to opportunities for innovation.

CAI practitioners and theorists in medical education assert that it offers a unique opportunity for broad-based innovation and cost-reduction- if a repertoire of challenging course materials is made available. The development and diffusion of clinical programs, however, will ultimately depend upon the sensitivity of the medical school administrator to (1) the capabilities of the computer as an educationally effective, cost-saving technology and (2) the dynamics of the process of innovation.

The results of this study imply (1) that medical school administrators are sensitive to cost factors essential to the development of sophisticated clinical programs and (2) that they are probably ready to listen to arguments for use or expanded use of programs in clinical education. However, the results also suggest that administrators are uncertain about three basic issues: distribution, replacement, and cost-effectiveness.

The uncertainty of the administrators with respect to distribution probably reflects the lack of a stable body of practices and procedures related to the marketing function. The implication here is that experts in the field of CAI should address this area or that the state of the art of course development suggest that distribution should be a future concern. Yet, it is encouraging that the administrators recognize that transferability of programs, rigorous testing, and some standardization of languages would facilitate diffusion efforts.

The indecision of the administrators regarding replacement probably reflects the tendency in higher education to add on change in instructional programs rather than to reallocate resources in support of the most promising instructional approaches. The implication of this tendency is serious, for the computer will not have a powerful economic impact on medical education unless replacement of some kind occurs at a reasonable point in the implementation process. Otherwise,

clinical programs will simply represent an add-on cost—a luxury which medical education cannot afford. The implication here is that in the initial planning for course development and implementation, all of the changes which must occur to facilitate effective utilization of programs, as well as realization of potential cost savings, should be examined.

The uncertainty of the administrators in regard to cost-effectiveness probably reflects the newness of this decision-making tool in educational settings. Consequently, the implication is that use of cost analysis in higher education is an area which will require considerable development before administrators can use it as an effective and fair decision-making tool.

Another implication of this study is that medical school administrators are indeed sensitive to the basic principles of innovation. For instance, their decided agreement with incentives and evaluation may imply that (1) they recognize that new rewards will be required to stimulate faculty involvement in CAI development and (2) that innovation requires a systems approach to evaluation.

An examination of the structural character of the home institutions of the three groups of administrators revealed that medical schools are also sensitive to the need for new structures to manage change. This is evident in 20 schools in Group 1 and 4 in Group 2, which have already instituted new offices or administrative posts for monitoring the process of innovation at the administrative level. This may imply that medical schools are gearing themselves for innovation and that they are particularly sensitive to opportunities for promising change.

In summary, the results of this study suggest that medical school administrators are receptive to cost factors relevant to course development. However, their views of basic phases of the production process and key cost issues such as cost-effectiveness and cost savings will probably remain conservative until

there are data available on (1) effective models and procedures for production, (2) the educational effectiveness of programs and, (3) the requirements for realizing CAI cost savings. A curious observation was that despite the financial plight of medical schools, administrators tend to question whether sophisticated programs should represent an add-on or replacement cost.

CONCLUSIONS

The results of this study led to several conclusions. They were as follows:

1. Medical school administrators with broad CAI experience tend to have similar attitudes to the relevance of the following cost factors to production of sophisticated clinical programs as medical administrators with little or no background in CAI: authorship, incentives, distribution, replacement, evaluation, and training.
2. Medical school administrators are generally receptive to the relevance of authorship, incentives, evaluation, and training to production of sophisticated clinical programs.
3. Medical school administrators would probably be more receptive to distribution if they had access to data which identified the requirements and procedures for effective performance of the dissemination function. Similarly, they would be more receptive to replacement as an approach to cost justification for program production if data were available on the requirements for replacement.
4. Medical school administrators express uncertainty about the role cost-effectiveness should play in the production of sophisticated clinical programs.

REFERENCES

1. Levien, R. E., et al. The Emerging Technology, Instructional Uses of The Computer in Higher Education. A Carnegie Commission on Higher Education and Rand Corporation Study. New York: McGraw-Hill, 1972.

2. Luskin, B. J. An Identification and Examination of Obstacles to the Development of Computer Assisted Instruction. Unpublished Ed.D. thesis, University of California, Los Angeles, 1970.

3. Anastasio, E. J. and Morgan, J. S. Factors Inhibiting the Use of Computers in Instruction. Final Report. EDUCOM. Interuniversity Communications Council, Inc., Princeton, New Jersey: 1972.

4. Stolurow, L. M., et al. Computer-Assisted Instruction in the Health Professions. Entelek, Inc. Newburyport, Massachusetts: 1970.

5. Cooley, William W. and Lohnes, Paul W. Multivariate Data Analysis. New York: John Wiley & Sons, Inc., 1971.

6. Williams, Mary Carter. The Attitudes of Medical School Administrators Toward Cost Factors Relating to Computer-Assisted Instruction. Unpublished Ph.D. dissertation, Catholic University of America, Washington, D. C.: 1975.

Table 1

Subscale Reliabilities

Subscale	No. of Items	Alpha Coefficient	Spearman-Brown Index (Step-up Unit=40 Items)
1. Authorship	4	.22	.73
2. Incentives	3	.48	.93
3. Distribution	7	.21	.60
4. Replacement	5	.42	.85
5. Evaluation	4	.37	.85
6. Training	5	.30	.77

Table 2

Group Means, Standard Deviations, and
Likert Scale Equivalent Means

Subscale	Group 1 (N=48)		Group 2 (N=23)		Group 3 (N=8)	
	Mean (S.D.)	Likert Means	Mean (S.D.)	Likert Means	Mean (S.D.)	Likert Means
1. Authorship	14.71 (1.99)	3.68	14.52 (1.81)	3.63	14.25 (1.83)	3.56
2. Incentives	12.63 (1.63)	4.21	11.91 (1.62)	3.97	12.00 (0.76)	4.12
3. Distribution	24.31 (3.30)	3.47	24.61 (2.62)	3.52	24.38 (2.88)	3.49
4. Replacement	16.06 (2.00)	3.21	16.61 (2.73)	3.32	17.00 (1.69)	3.27
5. Evaluation	16.98 (1.82)	4.24	17.09 (1.59)	4.27	16.88 (1.13)	4.25
6. Training	19.13 (2.02)	3.82	19.17 (2.00)	3.83	19.11 (2.00)	3.83